

m/035/002

cc: Dr. Dianne Nielson, Utah Department of Environmental Quality.
Dr. Eva Hoffman, U.S. Environmental Protection Agency Region VIII
Richard P. Bay, Jordan Valley Water Conservancy District
Jon Cherry, Kennecott Utah Copper
Dan Hall, State of Utah Division of Water Quality
William Moellmer, State of Utah Division of Water Quality
Jared Manning, Utah Division of Water Rights
Tom Munson, Utah Division of Oil, Gas and Mining
Karl Kappe, Utah Division of Forestry, Fire and State Lands

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AUG 17 2001

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OIL GAS AND MINING

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m/035/002

Kennecott

August 3, 2001

Mr. Douglas Bacon
Utah Department of Environmental Quality
Division of Environmental Response and Remediation
168 North 1950 West
Salt Lake City, UT 84116

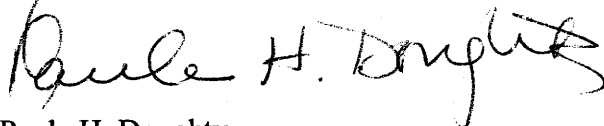
RE: Kennecott Utah Copper Corporation, Jordan Valley Water Conservancy District's Proposal to the Utah State NRD Trustee and U.S. EPA CERCLA Remedial Project Manager for a Groundwater Extraction and Treatment Remedial Project in The Southwestern Salt Lake Valley, revision date of January 15, 2001.

Dear Mr. Bacon,

Kennecott Utah Copper Corporation (KUCC) received the comprehensive comments of the Utah Department of Environmental Quality (UDEQ) and the Utah Department of Natural Resources (DNR) regarding the revised proposal, referenced above. This letter contains an enclosure, the purpose of which is to address both the general and specific comments in your letter of May 21, 2001. The enclosure states the original comment from your letter, followed by KUCC's response. The Jordan Valley Water Conservancy District (JVWCD), in a separate document, is addressing comments 1, 2, 4, 5, 6, 7 and 18.

KUCC appreciates the opportunity to work with UDEQ and DNR to remediate the ground water plumes located in the Southwest Jordan Valley. If you have any question, feel free to call me at (801) 536-4282.

Sincerely,



Paula H. Doughty
Manager, Environmental Projects

Enclosure

General Comments on the NRD Proposal:

- 1) *The current proposal does not sufficiently address concerns raised by UDEQ on the previous draft proposal. UDEQ is willing to defer resolution of these concerns until Remedial Design. Consequently, language in this proposal should be added to indicate that design specifics will be worked out during the CERCLA RD/RA. This same language should also be included in the three-party agreement between the State, KUCC, and the JWCD. It should be clearly understood and stated that the Trustee is agreeing to the conceptual approach of the project, but that details relating to the design and implementation of the project (see next paragraph) will be provided as the project progresses.*

Some of the details to be deferred to the RD/RA include: (a) KUCC's determination that the tailings line can handle the flow rate and concentrations of the two Zone A concentrate streams, (b) determination and optimization of the pumping rates to remove both plumes in the shortest time possible, (c) disposal methods post mine closure for the RO concentrate stream from both Zone A and B and the NF concentrate stream from Zone A, (d) application and approval of a UPDES permit relating to the Zone B concentrate discharge to the Jordan River, (e) approval from the State Engineer's (SE) office for certain institutional controls to aid KUCC in providing containment of both plumes, (f) a plan for monitoring the containment and reduction of the two plumes, and (g) approval from the SE's office of the water rights change requests by KUCC and the JWCD.

KUCC Response:

Language in the proposal will be added to indicate that the design specifics will be worked out during the CERCLA RD/RA process. However, the application and approval of a UPDES permit for the Zone B concentrate discharge to the Jordan River is addressed in the proposal and the permitting work is proceeding by the JWCD. The discharge of the Zone B concentrate stream to the Jordan River is not a matter that will be addressed in the RD. As a contingency, alternatives for disposing of the Zone B concentrate in the KUCC tailings or directly to the Great Salt Lake will be addressed in the remedial design. A copy of the Remedial Design Work Plan will be attached to the proposal as an appendix.

It is not entirely clear from this comment what language the State is requesting be included in the three party agreement among the State, KUCC and the JWCD. However, KUCC does not anticipate any difficulty in reaching agreement on language to be added to the agreement to address the concept.

- 2) *Please clarify as much as possible, the intended pumping rates of Zone A. Table 5.2A does not agree with Table 3 in Appendix E. These tables deal with the proposed pump rates of the Zone A wells. The rates in Table 3 of Appendix E represent a change from the previous proposal. Pumping within the acid plume has been increased and commensurately decreased at the outer wells. The Division of Water Quality (DWQ) concurs with the change in Table 3 of Appendix E. The ultimate pump rates for the Zone A wells will likely change as first-hand experience is gained during the remediation. However, it should be clear that the containment and removal of the most acidic portion of the plume is the highest priority.*

DWQ reiterates its position that there are large uncertainties in the modeling and that the best chance for containment success lies in concentrating pumping activities within the core of the acid plume.

KUCC Response:

The current plan is to extract contaminated water according to the schedule outlined in Table 3 of Appendix E. Table 5.2A will be modified to reflect this plan and both tables will clarify that the extraction rates are anticipated, but subject to change as circumstances require. Thus, the ultimate extraction plan will be based on monitoring of the aquifer system. Monitoring of the aquifer system will be used to determine if the scheduled extraction rates and locations achieve the goal of containing the contamination and removing as much of the acid plume as quickly as possible, while balancing any potential drawdown impacts on the aquifer. Modifications to the extraction schedule will likely occur as a result of this monitoring. A detailed monitoring plan will be provided as part of the CERCLA Remedial Design process.

- 3) *KUCC is working with DWQ to draft a mine closure plan. The final plan will include the method of disposal for associated mine waters, e.g. eastside collection, pit pumping, storm runoff, shaft/tunnels etc. The affect of these additional discharges to the tailings line after mine closure has not been fully evaluated and could have a substantial impact on the ability to discharge these effluent streams. As the information is available it is recommended that KUCC coordinate these activities-mine closure and remediation, to resolve possible conflicts as soon as possible.*

KUCC Response:

KUCC is working with DOGM and DWQ to develop a mine closure plan that will address water management issues. Long-term water management is the most significant component of either plan. Routine meetings with DOGM, DWQ and DERR to discuss closure issues and resolve conflicts are occurring. An overview of ground water remediation activities was presented to the group at the last meeting. It is KUCC's intent to draft a comprehensive mine closure plan that will address the concerns of all regulatory agencies.

- 4) *The plan does not specify the location of monitoring wells or the method for determining performance of the containment system beyond the general outline of the EPA Record of Decision (ROD) for the Southwest Jordan Valley ground water plume cleanup. DWQ understands that much of the performance specifics will be worked on during the RD/RA activity of the CERCLA action. However, it should be noted that without these specifics, it is difficult to estimate the ability of the NRD proposal to actually meet the containment requirements of the ROD or the Natural Resource Damage Consent Decree (NRDC). As has been noted in previous comments, the NRDC and the CERCLA response have somewhat conflicting goals, i.e., water production versus cleanup. Production of water for the NRD action should not come at the expense of plume containment. Further movement of the plume beyond Kennecott property will increase the cost and difficulty of aquifer cleanup.*

KUCC Response:

As noted above, a detailed groundwater monitoring plan will be developed as part of the Remedial Design process. The purpose of the plan will be to monitor the groundwater in the affected area to determine if containment and remediation goals are being achieved. Kennecott believes that the remedial design proposal will meet the containment and contaminant removal of both the CERCLA and the NRD Consent Decree. Both actions seek to contain, cleanup and prevent the spread of contamination, not only the acid plume, but the sulfate contamination as well.

The NRD Consent Decree requires Kennecott to "[p]ump water from the plume based on a rolling average of 400 acre feet of water on an annual basis over a five year period from the low pH plume which will remove contaminants from the aquifer and help to contain that plume." Kennecott is required to operate the extraction well "[u]nless it is determined by the Trustee, EPA or other applicable authority that pumping is causing spread of the plume, or unless an alternative action of equivalent benefit is undertaken to remove contaminants from the aquifer and help contain the plume.

- 5) *The Division of Water Rights (DWR) has a question about the water rights to be used in Zone A. Currently, there does not appear to be enough water on paper to cover the proposed extractions as shown in the following table, please respond. (All values are in acre-feet per year unless specified otherwise.)*

<i>Wells</i>	<i>Proposed Maximum Withdrawal^a</i>	<i>Required Water Rights</i>	<i>Existing Water Rights</i>	<i>Additional Water Rights Needed</i>
<i>1193 & 109</i>	<i>3500</i>	<i>3874 (5.35 cfs)^b</i>	<i>6487^c (8.96 cfs)</i>	<i>1814 (2.51 cfs)</i>
<i>(5) Acid Wells</i>	<i>4000</i>	<i>4427 (6.11 cfs)^b</i>		
<i>Sulfate Well</i>	<i>800</i>	<i>800</i>	<i>203^d</i>	<i>597</i>
<i>Zone A Total</i>	<i>8300</i>	<i>9101</i>	<i>6690</i>	<i>2411</i>

^a From Table 5.2A of the report

^b Based on 330 full days of pumping per year

^c From approved change application a24720

^d Subject to further review of pending change applications a25109 & a25110

KUCC Response:

The proposed plan calls for a staged extraction rate for different locations. For example, the current existing Acid Well (ECG1146) could be pumped at 2500 gpm or 2500 to 3800 acre feet per year for the first several years. During this same time period the 1193 and 109 wells will have a combined total extraction of approximately 2800 to 3500 acre feet per year for the first several years. During the first several years of acid extraction, the hydrologic response will be monitored and the tentative schedule calls for additional acid extraction from a second acid well and reduced extraction from the first acid well. Over time, additional acid extraction wells will be added and the total amount of acid water extracted for any given time period will not substantially vary due to the capacity of the treatment facilities. It will be imperative to have flexibility built into the location of extraction so that the plume can be contained. The total extraction rate for any single year from Zone A would not exceed ~7000 acre feet per year.

If additional water right change applications become necessary, KUCC has additional certificated water rights, currently in use for process water that could be moved into the remedial area, subject to appropriate approvals by the State Engineer.

Specific Comments on the NRD Proposal:

- 1) *Section 1.1 Executive Summary, the last paragraph, page 2: This paragraph is in quotation marks, yet it is not attributed to any source. Please explain why the paragraph is in quotation marks or attribute to a source.*

Response: (JVWCD addressing under separate document)

- 2) *Section 2.1 Natural Resource Damage Claim and Consent Decree (UDEQ), 2nd paragraph, page 3: Please be advised that the successor trustee was the Director of the Utah Department of Environmental Quality, whose position was not created until 1991. This correction should be made in the text.*

Response: (JVWCD addressing under separate document)

- 3) *Section 2.2 Federal CERCLA Requirements (USEPA), 4th paragraph, page 6: It is indicated in the paragraph that the final results of the ground water modeling conducted by KUCC were approved by the USGS. If this is so, a copy of the approval letter or memorandum by the USGS should be included as an appendix to this proposal. Please provide.*

KUCC Response:

Pat Lambert from the USGS participated in the development, calibration and review of the groundwater modeling conducted by KUCC. Although, there is no formal letter of approval, model and/or modeling results were presented to the South Facilities Technical Review Committee (TRC) and received its concurrence.

- 4) *Section 2.3 KUCC/JVWCD Study and Conceptual Design, 1st paragraph, page 6: It has been erroneously stated that the Lost Use component of the treated water was not*

contemplated by the Consent Decree (CD). The 1,235 ac-ft ALost Use≅water value was included in the \$9 million dollar cash settlement portion of the CD (see Attachment 16 of the Consent Decree). Please correct this statement in the text.

Response: (JVWCD addressing under separate document)

- 5) *Section 3.2 Meet the Intent and Remedial Requirements of CERCLA, 3rd bullet, page 8: Please revise the proposal to state that the plume is to be contained and kept from migrating as well as enlarging.*

Response: (JVWCD addressing under separate document)

- 6) *Section 3.3 KUCC/JVWCD Purposes, 4th bullet, page 9: The 4th bullet item appears as if it may be incomplete. Please review and correct.*

Response: (JVWCD addressing under separate document)

- 7) *Section 5.2 Groundwater Extraction, page 11: The Division of Oil, Gas and Mining (DOGM) would like to point out that pumping of the shallow wells may reduce the amount of ground water normally flowing into the Jordan River. Allowable concentrations of Coca's, proposed for discharge from the treatment facilities into the Jordan River, appear to be based on normal flow volumes. Please explain if allowable discharge concentrations of Coca's take into consideration the potentially reduced volume of surface water in the river from the shallow well extraction.*

Response: (JVWCD addressing under separate document)

- 8) *Table 5.2A, page 12: DWR is uncertain as to precisely how much water is to be pumped from Zone A. Table 5.2A lists a total volume ranging from 6,000 B 8,300 acre-feet per year of extraction. Table 5.4A shows 4,600 acre-feet per year as feed water in Zone A. There needs to be a more specific accounting of the volume of water to be extracted (on a year-by-year and well-by-well basis) as well as a description of the use of all the water.*

KUCC Response:

Table 5.2A will be revised similar to Table 3 in Appendix E which indicates which indicates the schedules and extraction rates of individual wells (see responses to general comments # 2 and 5)

- 9) *Section 5.4 Water Treatment Plants, page 12: The Zone-A treatment plant and associated pipelines will be built on ground owned by KUCC. The facility will need to be included in the DOGM reclamation bond for the Bingham Canyon Mine.*

KUCC Response:

There are several reasons why the Zone A treatment plant and associated pipelines will not need to be included in DOGM permitting and bonding. The Zone A RO plant serves a dual purpose, - both to meet the objectives of the NRD and to complete part of the CERCLA remediation

(containing the plume). To the extent that any of these facilities are located on-site and are part of a CERCLA remedy, they are exempt from federal and state permitting requirements pursuant to CERCLA section 121(e)(1), which provides: *"No Federal, State, or local permit shall be required for the portion of any removal or remedial action conducted entirely onsite, where such remedial action is selected and carried out in compliance with this section."*

Additionally, the RO water treatment to make municipal quality water is not a "mining operation" as that term is defined in UCA 40-8-4(8) which states, *"mining operation means those activities conducted on the surface of the land for the exploration for, development of, or extraction of a mineral deposit, including, but not limited to, surface mining and the surface effects of underground and in situ mining, on-site transportation, concentrating, milling evaporation, and other primary processing."* Nevertheless, the Zone A reverse osmosis treatment plant already meets the objectives of the mined land reclamation act which is *"to return the land... to a stable ecological condition compatible with past, present, and probable future local land uses."* Utah Cod Ann. 40-8-12. The RO treatment plant, including building and skids and the pipeline that will take drinking water to the JVWCD's Zone C Reservoir, will be transferred to the JVWCD at a future date providing water to the Jordan Valley residents long into the future. There is no question that providing drinking water to the public is consistent with local land uses.

10) *Section 5.6 Concentrate Disposal, the 2nd paragraph and Table 5.6A, page 14: It states in the second paragraph that the change in chemistry of the tailings water due to the introduction of RO concentrate water is very small. However, Table 5.6A indicates that the percentage increase of lead would be 20%. Please explain why a 20% increase in lead is not a significant increase.*

KUCC Response:

The data in the table do show that the lead concentration increases by 20 percent when the RO concentrate is combined with tailings flow. However, the 20 percent increase represents an increase of a very small initial lead concentration. The initial lead concentration in the tailings line is 2.5 ppb in a flow of about 34,500 gpm. The lead concentration in the RO concentrate is 34 ppb in a flow of about 600 gpm. The lead concentration of the combined flow is 3 ppb. Therefore, the lead concentration in the tailings line increased by 0.5 ppb. From KUCC's view, this is a very small change in the overall chemistry of the tailings line even though it represents a 20 percent increase in the lead concentration.

11) *Table 5.6A, page 14: A meeting took place between DWQ and KUCC to discuss the concentration of the contaminants of concern (CoC's) in the discharged effluent. To date the information in Table 5.6A on page 14 of the proposal does not represent the same information provided in a spreadsheet to DWQ during the January 2001 meeting. KUCC still has not met its obligations to determine if the discharge locations can handle the potential concentration of the CoC's which will be discharged.*

KUCC Response:

Information presented at the meeting has been updated as additional information has become available. Another meeting with DWQ will be scheduled to review the RO concentrate data and how it relates to the overall KUCC process water system. During active mining operations, the concentrate will be treated in the tailings line with the effluent subject to existing UPDES permit discharge limits. Post mining, the concentrate will be evaluated for direct discharge to the GSL, a combination with other meteoric flows, and/or treatment. As part of the Remedial Design process, a preliminary post closure treatment plan will be developed and provided to the TRC. This will address the potential CoC's which will be discharged pre- and post-mine closure.

- 12) *Section 5.6 Concentrate Disposal, pages 14 - 17: The current proposal and the Project Agreement (PA) (see Section 7.1 Initial Concentrate Disposal Facilities: Permitting of the PA) still do not distinguish disposal options for the two Zone A concentrate streams, namely the RO and NF waste streams. It has verbally been stated to UDEQ that the NF concentrate stream will not be discharged into the Great Salt Lake. However, in these two sections of the Proposal and PA, the Zone A waste streams are not differentiated for disposal. In the proposal and PA there needs to be a clear delineation of these two waste streams and their disposal options.*

KUCC Response:

As stated above, the Zone A RO concentrate stream will be combined with the process tailings stream during active mining operations. Likewise, the NF concentrate will be combined and treated with tailings during active mining operations. A significant aspect of the Remedial Design plan will be the preliminary post closure design. This design will identify and evaluate disposal options for the concentrate streams after the cessation of active mining operations. As a fall back scenario, standard lime treatment was evaluated and considered as part of the feasibility study in 1998. This technology has the capability to treat the NF concentrate and could be implemented in a relatively short period of time. Obviously the sludge generated from a lime treatment process would require permanent storage, although it would likely be non-hazardous.

KUCC believes that both the Project Agreement and the Proposal adequately distinguish between the Zone A RO concentrate and the NF concentrate streams. Section 7.1 of the Project Agreement distinguishes between the RO and the NF concentrate streams because of the specific definitions in the agreement. Section 7.1 discusses the possibility that "Zone A Plant" concentrates will be disposed in the Great Salt Lake. Section 1.39 of the Project Agreement defines "Zone A Plant" as "the Zone A reverse osmosis water treatment system..."

Likewise, KUCC believes that Section 5.6 of the Proposal adequately distinguishes between the RO and NF concentrate streams when discussing disposal to the Great Salt Lake. In fact, Section 5.6 does not pertain to the NF concentrate stream. Section 5.6 states that "KUCC proposes to use its existing tailings slurry conveyance pipeline from Bingham Canyon to the North tailings impoundment for conveyance of concentrate from the Zone A treatment plant (see Figure 5.4A)." Proposal at 14. Figure 5.4A shows that concentrate from the RO plant would go to the tailings line or possibly the Great Salt Lake. Figure 5.4A also shows that concentrate from the NF would go to the tailings line or other alternative treatment and disposal options. Although Table 5.6A

needs to be revised (see comment and response to #11 above), the table refers to the RO concentrate. Additionally, section 5.6 states that "KUCC proposes to discharge the RO concentrate directly to the Great Salt Lake..." Proposal at 15.

13) *Section 5.6 Concentrate Disposal, pages 14 - 15: The Division of Forestry, Fire and State Lands (DFFSL) agrees that as long as the Zone A concentrate discharge is permitted by DWQ, the UPDES program is sufficient to regulate the concentrate disposal to the Great Salt Lake.*

No response required.

14) *Section 5.6 Concentrate Disposal, pages 14 - 15: The DFFSL and the Division of Wildlife Resources (DWR) are concerned about the potential impact a discharge of Zone A brine water may have on the egg and naupili stages of the brine shrimp. A meeting was held between DWR, KUCC and UDEQ to discuss this concern, at which time those involved agreed to gather further information on the potential effects of the brine discharge from Zone A. To date this information has not been provided and the concern has yet to be resolved.*

KUCC Response:

Concerns have been raised regarding the sensitivity of brine shrimp nauplii to metals that may occur in the Zone A brine water. This issue has also been raised in previous reviews of discharges to the Great Salt Lake. To investigate the sensitivity of nauplii to metals, KUCC reviewed the literature and summarized the issues in a report entitled "Ecological Risk Assessment Great Salt Lake (ep&t and Parametrix, 1998). Since the issuance of this report KUCC has continued to investigate this issue. Information available is summarized below.

The sensitivity of brine shrimp (*Artemia franciscana*) to metals and metalloids has been relatively well studied. Acute and chronic toxicity studies have been conducted on several different life stages (cysts, nauplii, adults) using various metals while a more limited number of chronic toxicity studies have been conducted.

Using available chronic toxicity data and safety factors applied to acute toxicity data when chronic data was unavailable, our analysis concluded that brine shrimp are relatively insensitive to metals and metalloids, typically being in the upper quartile (i.e., 75-100th percentile) of all species tested (Table 1).

Table 1. Summary of Brine Shrimp Sensitivity to Metals and Metalloids.

Metal/Metalloid	Chronic Toxicity Threshold (ug/L)
Arsenic ¹	11,000
Cadmium	790
Copper	18-274
Lead	1,118
Selenium ¹	5,000
Zinc	112

¹Note the chronic toxicity thresholds for selenium and arsenic were developed by KUCC at Parametrix, Inc. utilizing full life cycle chronic tests.

The chronic toxicity thresholds developed in this summary specifically excluded several studies (Bagshaw et al. 1986, MacRae and Pandey 1991, Rafiee and Matthews 1986) conducted using the methodology first described in Bagshaw et al. (1986). This methodology involves exposing brine shrimp cysts to the chemical of concern for 72 hours and evaluating percent hatch and emergence of the cysts. This methodology and the results derived using it have several problems associated with them that make the data unusable for the Great Salt Lake:

- 1.) The method typically uses relatively low salinity (e.g., 25 g/L) water throughout the exposure period that does not reflect real world conditions. In reality, brine shrimp cysts hatch in the low salinity freshwater lens of the Great Salt Lake (GSL) and as soon as the cyst cracks, they sink into the more saline waters below the lens where the shrimp emerge. Consequently, the Bagshaw et al. method creates an unrealistically stressful environment in which to evaluate the emergence endpoint.
- 2.) Studies performed using the methodology of Bagshaw et al. were not performed in water from the GSL. This is critically important for assessing divalent metals due to the high levels of calcium, sodium and magnesium. Further, the presence of sulfate in the GSL (8500 ppm) significantly reduces selenate accumulation by brine shrimp. Additionally, the GSL contains on average about 35 mg/L of dissolved natural organic matter (NOM). Copper and zinc are readily bound by NOM and their bioavailability is significantly reduced. Ignoring the importance of using of GSL water metals and metalloids, could result in an over estimate of the toxicity by a factor of 10-100 or even more (see number 3 below).
- 3.) Study results are inconsistent with studies by other researchers that evaluated the same endpoints (hatching and emergence) under more realistic exposure regimes. For example, MacRae and Pandey (1991) estimated a LOEL (Lowest Observable Effect Level) of 6 ug/L copper using the methodology of Bagshaw et al. In contrast, Gebhardt (1976) conducted a study using water from the Great Salt Lake as dilution water, and estimated a LOEL of 1 mg/L copper when conducting a full life cycle study (i.e., evaluated all endpoints including hatching and emergence).
- 4.) The toxicity thresholds resulting from studies using the Bagshaw et al. methodology are frequently lower than background metal concentrations in the Great Salt Lake. For example,

Taylor et al. 1977 and ep&t and Parametrix (1998) both report background copper concentrations in the Lake at 9 ug/L. This is 1.5 times higher than the 6 ug/L effects threshold developed using the Bagshaw et al. method. Similarly for zinc, the reported background concentration for zinc in the Lake is 11 ug/L (Taylor et al. 1977) compared to the 6 ug/L threshold for zinc (i.e., background zinc is 1.8 times higher than the threshold). If these thresholds were truly applicable to the Great Salt Lake, then brine shrimp should not currently be present in the Lake.

Considering the above, studies conducted using the Bagshaw et al. method are not appropriate for estimating toxicity thresholds for the Great Salt Lake. To address the shortcomings of this method, KUCC sponsored Parametrix to conduct hatchability studies with *Artemia* under exposure conditions more relevant to the Great Salt Lake. Specifically, hatching success over a 48-hour period was assessed using Great Salt Lake water diluted to a salinity of 20 g/L as the dilution water. To date, two tests have been completed with copper resulting in EC50s of 1238 and 1764 ug/L and Chronic Values¹ of 283 and 566 g/L, respectively. These results appear to validate the concerns regarding results from the Bagshaw et al. method being inappropriate for the Great Salt Lake.

References

- Bagshaw, J.C., P Rafiee, C.O. Matthews, and T.H. MacRae. 1986. Cadmium and zinc reversibly arrest development of *Artemia* larvae. Bull. Environ. Contam. Toxicol. 37: 289-296.
- Ecological Planning and Toxicology and Parametrix. 1998. Ecological risk assessment of the Great Salt Lake. Report prepared for Kennecott Utah Copper, Magna, Utah. Prepared by ecological planning and toxicology, Corvallis, Oregon.
- MacRae, T.H. and A.S. Pandey. 1991. Effects of metals on early life stages of the brine shrimp, *Artemia*: A developmental toxicity assay. Arch. Environ. Contam. Toxicol. 20: 247-252.
- Rafiee, P., C.O. Matthews, J.C. Bagshaw, and T.H. MacRae. 1986. Reversible arrest of *Artemia* development by cadmium. Can. J. Zool. 64: 1633-1641.
- Taylor, P.L., L.A. Hutchinson, and M.K. Muir. 1977. Heavy metals in the Great Salt Lake, Utah. Utah Geology 4: 19-28.

15) *Section 5.6 Concentrate Disposal, pages 14 - 17: The greater flow of tailings slurry, which is anticipated to stabilize the corrosive and precipitating nature of the concentrate streams, will only be present during active mining operations. The scenario of the concentrate streams and post mining flow in the tailings line should also be discussed.*

KUCC Response:

As noted in response to comment No. 13, the RD will include a study of various treatment and concentrate disposal options for the post-mining period.

Disposal of concentrates into the KUCC tailings impoundment is also subject to regulation by

¹ The Chronic Value is defined as the geometric mean of the NOEC and LOEC (Stephan et al. 1985).

DOGM under the Minerals Rules of the Utah Mined Land Reclamation Act, under permit number M/035/015. The impacts of concentrate disposal in this facility (during active mining and after mine closure) on the currently approved reclamation plan will need to be discussed and the reclamation plan amended, as needed.

KUCC Response:

A study that addresses short and long-term geochemical impacts on the tailings system is included in the RD. Additionally, KUCC's continual acidification research and operational monitoring as required under permit M/035/015 and Groundwater Discharge Permit UGW350011 allow for monitoring of variations in the chemistry of tailings inflows. The current reclamation surety estimate for the tailings impoundment includes the surface application of approximately 50 tons per acre of limestone equivalent to 35% of the embankment surface. Should the continual research demonstrate that long-term erosional and vegetative stability of the tailings embankment is improved or hampered by the disposal of concentrates into the tailings impoundment and an adjustment in tailings surface treatment is required, an amendment to the approved mining and reclamation plan and adjustment to surety estimate would occur.

- 16) *Section 5.6 Concentrate Disposal, last paragraph, 1st sentence and associated bulleted items, pages 16 - 17: The first sentence is inaccurate. The list of bullet items are erroneously identified as assumptions in reaching the NRD settlement. Specifically, the second and third bullet items listed were not assumptions the State made in reaching the NRD settlement. These are assumptions that KUCC and the JWCD are making for purposes of this proposal that UDEQ has not accepted. UDEQ reiterates here again, that permitting requirements are subject to change, and reissuing of permits would be subject to current, at time of reissuance, permit requirements. Also, any discharge to any surface water body, whether it be the Great Salt Lake or the Jordan River will have to meet any existing federal, state or local requirements.*

KUCC Response:

The paragraph cited was intended to identify assumptions made by KUCC and JWCD for purposes of developing the proposal. The reference to the "NRD settlement" will be deleted. The language indicates that flexibility on KUCC's and JWCD's part will be needed if the assumptions cease to be viable. KUCC and JWCD agree with the UDEQ that permitting requirements are subject to change, and that renewed or new permits would be subject to regulations and laws effective at the time of permit issuance or renewal.

- 17) *Sect. 7.3 Proposed Change Applications for the Project and Table 7.3A, pages 21 and 22: To date there has been only three KUCC water rights that have been converted by the State Engineer for use during the cleanup project. The State Engineer has to approve the water allocations to be withdrawn from the aquifer as well as the water rights (by definition of allocation). Currently, there are five outstanding water rights either under review by or awaiting review by the State Engineer, which need to still be approved.*

KUCC Response:

We agree that the State Engineer administers and allocates water rights. We anticipate approval of change applications needed during the remedial action. To date, the State Engineer has approved the largest of the anticipated change application (a24720) and we would expect the continued cooperation for the State Engineer.

- 18) *Section 7.4 Proposal to the State Engineer Concerning Water Rights, paragraph 3, page 22: It states "KUCC is committed to assist affected property owners . . . in cases where the presence of contamination causes an additional cost burden to the property owner." The State Engineer believes this statement should be broadened to include assistance to affected property owners in cases where the remedial project, itself, causes an additional cost burden to the property owner. Some examples of these additional costs are: increased pumping costs, deepening of wells, replacement water, costs associated with land subsidence, and other related problems. Though the State of Utah's Natural Resource Damage Claim does not settle private claims associated with the contaminated resource nor its associated cleanup, the proposal to the Trustee needs to include or acknowledge the potential for interference to nearby property owners.*

KUCC Response:

Consistently, KUCC has been willing to work **with** third parties to address impacts from contamination caused by KUCC or its predecessors. Likewise, KUCC is willing to work cooperatively with third parties that are directly **impacted** by KUCC's activities under the remedial project. However, it is important to **note** that KUCC is not increasing the amount of water it has historically diverted from **the aquifer** under its senior vested water rights. KUCC has merely filed a change application to **divert** its existing rights from new points of diversion, but within the same aquifer. KUCC, along with other senior water right holders, has suffered from the adverse impacts of over-pumping by water users with junior priorities.

Also, the proposed project would require additional pumping in an area that is already experiencing significant ground water level declines, and has the potential to affect water users in a number of ways. The water levels of their wells may decline, or it may become necessary for the State Engineer to limit the overall amount of withdrawals in order to protect the aquifer system. Therefore, approval of water right change applications and increased pumping rates in this area may be subject to certain criteria such as compensation to affected entities, or water rights owners.

Response: (JVWCD addressing under separate document)

- 19) *Section 8.5 Avoided Capital Costs, 1st paragraph, page 24: In the first sentence, it states that the NRD Trust Fund was created to Address contamination of ground water that might otherwise have been developed for municipal purposes by municipal water purveyors. This is not necessarily true for the creation of the Trust Fund, although the CD does allow for a return of a portion of the Trust Fund to Kennecott if waters are treated and purveyed to users in the affected area. The Trust Fund was created due to the payment of damages based on injury to the resource and funds in it are simply to be used to Restore, replace, or*

acquire the equivalent of the surface or ground water resources lost, for the benefit of the public in the affected area. Please revise the proposal in reference to this comment.

KUCC Response:

The Proposal will be revised to respond to this comment, as follows:

The NRD Trust Fund was established using the payment of damages for injury to natural resources, to be used to restore, replace, or acquire water resources for the benefit of the public in the affected area. The Consent Decree allows a portion of the Trust Fund to be credited to Kennecott by providing municipal quality water for the benefit of the public in the affected area if certain conditions are met. The Consent Decree contemplates that the water purveyor(s) receiving the Trust Fund benefits would pay its avoided cost of developing groundwater, absent contamination. This is referred to as "cost of development without contamination" in Attachment 16 or the Consent Decree.

- 20) *Section 13.3 Contract Mileposts, 1st bullet, page 43: The definition of "Complete and Operational" should be consistent with the project agreements. Please correct the text of the proposal.*

KUCC Response:

Agreed. The Proposal will be revised so that it is consistent with the Project Agreements.

- 21) *Section 13.4 KUCC/JVWCD Agreement ("the Project Agreement"), pages 44 - 45: Please explain if, when ownership of the Zone-A plant and associated waste stream pipelines is passed to JVWCD, the DOGM bonding responsibilities for those facilities will be transferred also.*

KUCC Response:

As indicated in the response to item #9, the Zone A plant is 1) part of a CERCLA remedy, and 2) is a treatment facility that will provide culinary water to the public post-mining and as such does not fall under the definition of a "mining operation" subject to DOGM reclamation and bonding requirements. Therefore, KUCC does not intend to post a reclamation bond for the facility and thus no such bonding responsibilities would be transferred to the JVWCD.

- 22) *Section 14.1 Zone A, 4th paragraph, page 46: Please explain in this section where the lime-treatment sludge from the Zone A RO plant will be disposed of after mine closure.*

KUCC Response:

Should it be necessary to condition the water to adjust the pH for treatment, KUCC will characterize and identify appropriate disposal options.

- 23) *Section 16.0 Meeting USEPA CERCLA Requirements - Compliance with Potential ARAR's, page 53: It fails to state that the waste stream from the NF plant will be characterized to determine if it is hazardous waste, post mine closure. KUCC is correct that the concentrate streams from both the NF and RO treatment plants, directed to the Magna Tailings Impoundment (pre mine closure), would meet the standards of exemption of discharge limitations based upon the mixing rule. However, post mine closure discharges would no longer be mixed with mine tailings (which have a neutralizing capability, yet to be proven*

for the proposed flow) and hence the tailings line would no longer meet the definition of a treatment unit as proposed by KUCC. KUCC needs to follow the Applicable, Relevant and Appropriate Requirements listed in the EPA ROD.

KUCC Response:

KUCC's modeling suggests that the NF concentrate should not exhibit hazardous characteristics that would qualify the waste stream as hazardous after approximately five years of extraction. Pilot and bench scale testing show that the concentrate only exhibits a toxic characteristic for cadmium concentrations slightly above 1 mg/L. After approximately five years of extraction, this concentration should be less than 1 mg/L and thus not characteristically hazardous. Obviously the constituency of the nanofiltration stream will be closely monitored and a long term monitoring plan will be included in the Remedial Design.

Comment #23 states that "KUCC needs to follow the Applicable, Relevant and Appropriate Requirements listed in the EPA ROD." This statement is made in the context of discussing the potential characteristically hazardous nature of the nanofiltration (NF) concentrate. It is not entirely clear what is implied by the statement. Although preliminary studies indicate that the NF With respect to the last sentence in the foregoing comment, KUCC has attached an explanation of its position on the ARARS.

24) Section 16.0 Meeting USEPA CERCLA Requirements, pages 51 - 55: Use of the waste rock dumps for storage would preclude the closure of those areas impacted by the concentrate.

Comment is noted.

25) Section 16.0 Meeting USEPA CERCLA Requirements, pages 51 - 55: Construction of a lined facility for concentrate disposal within a KUCC mine permit area would require a modification to the currently approved mine permit(s) with DOGM. This modification would be subject to DOGM review under the appropriate section(s) of the Minerals Rules.

KUCC Response:

Permitting requirements, if any, will be reviewed for any option chosen for NF concentrate disposal. The Remedial Design Work Plan includes a permit analysis. However, it is KUCC's view that construction of such a repository would be part of a CERCLA remedial action. To the extent that such facilities are located on-site and are part of a CERCLA remedy, they are exempt from federal and state permitting requirements pursuant to CERCLA section 121(e)(1), which provides: "No Federal, State, or local permit shall be required for the portion of any removal or remedial action conducted entirely on-site, where such remedial action is selected and carried out in compliance with this section."

26) Section 16.0 Meeting USEPA CERCLA Requirements, pages 51 - 55: After mining ceases and the water treatment facilities continue to produce concentrates, please explain if the RO/NF concentrates will still be considered a byproduct of the former mining practices and therefore not subject to discharge limitations.

KUCC Response:

The source of the RO/NF concentrate streams are a mining source. Thus to the extent any question is raised as to whether the NF would be characteristically hazardous, the Beville exemption still applies.

RO/NF subject to ore mining and dressing when being discharged with mine-related discharges. With respect to UPDES discharges, it appears that post-closure discharges would not be subject to the ore mining and dressing limitations, which pertain to active mining operations. While the post-mining RO/NF concentrate discharges to jurisdictional waters of the State would not be subject to the ore mining and dressing effluent limitation guidelines in 40 CFR Part 440, any such discharge would be subject to other applicable limitations consistent with the relevant permitting program.

ATTACHMENT

Nanofiltration Concentrate

Not Subject to RCRA Hazardous Waste Requirements:

Nanofiltration ("NF") concentrates from the treatment of the heavy metals acidic plume water are not subject to RCRA hazardous waste requirements, for several reasons. First, NF concentrates result from the treatment of heavy metals acidic plume water, which was contaminated as a result of extraction and/or beneficiation of ores and minerals. These concentrates are therefore excluded from the definition of hazardous waste under the Bevill exemption. See 40 CFR § 261.4(b)(7). The regulatory status of acid mine drainage ("AMD") was specifically addressed in Friends of Santa Fe County v. LAC Minerals, Inc., 892 F. Supp. 1333 (D.N.M. 1995), where the court held that AMD "is undoubtedly exempt from hazardous waste status." 892 F. Supp. at 1342.

Furthermore, EPA has consistently taken the position that "[r]esidues arising from treatment of extraction or beneficiation wastes (e.g., sludge from treatment of acid mine drainage) are also excluded from regulation." *Identification and Description of Mineral Processing Sectors and Waste Streams*, U.S. EPA Office of Solid Waste, p. 47 (April 1998) (emphasis in original). See also RCRA/Superfund Hotline Monthly Summary (February 1985) ("Pollution control residues from the treatment of mining wastes [i.e., caustic sludges from the treatment of acid mine drainage] are also exempted."). It is noteworthy that both of these EPA guidance documents illustrate the principle—that pollution control residues from the treatment of mining wastes are also exempted—using the example of sludges from treatment of acid mine drainage. Kennecott's NF concentrates are likewise sludges from treatment of acid mine drainage and are therefore Bevill-exempt wastes.

Second, in developing ARARs, given that the NF concentrates are excluded from the definition of hazardous waste under Bevill, RCRA requirements are not "applicable." Additionally, EPA explains that RCRA requirements also will generally not be "relevant and appropriate" to Bevill wastes:

A requirement may also be found relevant but not appropriate when another requirement is available that has been designed to apply to that specific situation, reflecting an explicit decision about the requirements appropriate to that situation. For example, the Agency has made a determination under RCRA that Subtitle C is not an appropriate means of regulating on a national basis certain mining waste from the extraction or beneficiation of ores and minerals (51 FR 24496, July 3, 1986).

Therefore, since that explicit, formal determination has been made, Subtitle C requirements will generally not be relevant and appropriate to these wastes from extraction or beneficiation of ores and minerals.

CERCLA Compliance with Other Laws Manual, OSWER Dir. 9234.1-01, p. 1-68 (Aug. 8, 1988) (emphasis added). In this case it is not necessary or appropriate to subject the NF concentrates to

RCRA requirements because under the proposed remedy they will be managed in a manner that is protective of human health and the environment. In particular, they will be managed in a system subject to regulation under the Clean Water Act and under state groundwater protection requirements. To the extent there is a concern about the management of the NF concentrates when use of the tailings line is no longer a viable alternative for treatment (e.g., mining ceases), the protectiveness issue should not be addressed by improperly categorizing the NF concentrates (or the source – contaminated groundwater) as subject to RCRA. Rather, management of the NF concentrates should be addressed under other applicable standards for waste management, surface or groundwater discharges or similar requirements that may be applicable or relevant and appropriate.